REMARKS

Claims 31-70 are pending herein. By this Amendment, claims 32 and 50 are amended, and new claims 67-70 are added.

I. Drawings

The Office Action indicates that Figure 11 must be labeled with a legend such as "Prior Art." Applicants respectfully disagree.

Although Figure 11 is discussed in the background section of the present specification, such does not indicate that it is not inventive, as indicated in the Office Action, or that it is prior art. On page 5, lines 1+ of the specification, Figure 11 is discussed as being a graph prepared from data of experiments and investigations of the present inventors. The inventors' own investigations that led to the present invention are not prior art against them. A "Prior Art" legend for Figure 11 would be completely inappropriate.

Moreover, the discussion of Figure 11 in the background section was intended to provide an understanding of the inventors' investigations that led to the present invention. This work is thus a part of the entirety of the invention, and was properly included in the background section.

Finally, one reading the specification will readily be able to understand the purpose of Figure 11, and requiring an artificial and inappropriate designation on the drawing such as "Prior Art" would not aid in any understanding of the disclosure. In view of the accompanying description in the specification, it is not seen why any label is required for Figure 11.

For all the foregoing reasons, Applicants submit that Figure 11 does not require any label merely because it is in the background section of the specification. Reconsideration and withdrawal of this requirement are thus respectfully requested.

II. Objection to the Claims

Claims 31, 33, 35, 37, 39, 41, 43, 44, 46-49 and 66 were objected to on the grounds that the last five lines of claim 31 were not clear.

In accordance with the Patent Office's suggestion, claim 31 has been revised by this Amendment. Accordingly, reconsideration and withdrawal of this rejection are respectfully requested.

III. Rejection Under 35 U.S.C. §102(a)

Claims 31, 47, 49, 50 and 60 were rejected under 35 U.S.C. §102(a) as allegedly being anticipated by Shinji (JP 11-012730) considered together with Yang (U.S. Patent No. 6,358,636). This rejection is respectfully traversed.

Neither Shinji nor the supporting document Yang teaches or suggests the photomask blank of claim 31 because both references fail to teach or suggest a photomask blank having a flatness degree equal to -2 μm or less. Moreover, as Shinji does not teach or suggest the deposition rate described in the present specification for achieving such a flatness degree, Shinji cannot be found to inherently describe the recited flatness degree.

Further, neither Shinji nor Yang teaches or suggests the method of manufacturing a photomask blank according to present claim 50, both references failing to teach or suggest that "the formation of said thin film is conducted at a thin film deposition rate in a manner that a particle occurrence frequency dependent on the thin film deposition rate is restrained so that the production yield rate dependent on the particle occurrence frequency is within tolerance."

For at least the foregoing reasons, Applicants respectfully submit that the anticipation rejection relying upon Shinji and Yang is improper and must be withdrawn. Reconsideration and withdrawal of this rejection are respectfully requested.

IV. Rejections Under 35 U.S.C. §103(a)

A. Shinji with Yang, in View of Inoue

Claims 32, 51-54, 63 and 64 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over the teachings of Shinji and Yang, in view of the teachings of Inoue (U.S. Patent No. 6,309,515). This rejection is respectfully traversed.

The teachings of Shinji and Yang fail to teach or suggest the features of independent claims 31 and 50 as discussed above. These references further fail to teach or suggest the features of independent claims 32, 51 and 52 for the following reasons.

As with claim 50 discussed above, neither Shinji nor Yang teaches or suggests the photomask blank of claim 32, both references failing to teach or suggest that "the formation of said thin film is conducted at a thin film deposition rate in a manner that a particle occurrence frequency dependent on the thin film deposition rate is restrained so that the production yield rate dependent on the particle occurrence frequency is within tolerance."

Regarding claim 51, neither Shinji nor Yang teaches or suggests the claimed method of making a photomask blank in that both references fail to teach or suggest forming the thin film at a deposition rate of 0.5 nm/sec to 6 nm/sec.

Regarding claim 52, neither Shinji nor Yang teaches or suggests the claimed method of making a photomask blank in that both references fail to teach or suggest forming the photomask blank in accordance with the plurality of requirements set forth therein, including, for example, the sputtering power range.

Further, in the examples cited in the Office Action from these references, the following problems solved by the present invention are not disclosed at all. First, to restrain the particle occurrence frequency from the sputtering target so that the yield rate of the photomask blank manufacture is kept within tolerance, and second to restrain the particle

occurrence frequency from the sputtering target, and at the same time, to restrain the film stress of the thin film so that the flatness degree is restrained within tolerance.

The above-described problems are based on the following facts that were discovered first by the present inventors. These facts include that critical defects are brought into the photomask blank by adherence of the particles from the sputtering target to the thin film, or by peeling off of the adhered particles from the thin film. Therefore, the yield rate of the photomask production is largely dependent on the frequency of particle occurrence from the sputtering target. In turn, the occurrence frequency of the particles is dependent on the deposition rate of the thin film; in other words, the slower the deposition rate, the smaller the occurrence frequency becomes, and the faster the deposition rate, the larger the occurrence rate becomes. On the contrary, the slower the deposition rate of the thin film, the larger the crystal grain in the thin film and the film stress becomes large. By making He be contained in the thin film, the crystal grain size of the thin film can be small even when the deposition rate of the thin film is slow, so that the film stress is restrained equal to or less than the predetermined value and the flatness degree of the thin film can be restrained within tolerance.

In the cited examples from Shinji, only the following are disclosed: (a) a chromium thin film having a thickness of 50 nm formed on a bare silicon substrate having a thickness of 480 μm by RF sputter using a He-Ar gaseous mixture consisting of 75 to 95% helium gas and 5 to 25% argon gas as a sputter gas (see column [0018], etc.); and (b) that by using helium which is smaller in atomic number than argon as a sputter gas, inclination of the slope changing from the compressive stress to the tensile stress is in a curved line showing that a relation between the sputter gas pressure and the film stress can be made moderate, thereby improving the controllability of stress (see column [0012], FIG. 1, etc.).

Thus, the content of the above-described disclosure of Shinji only shows that since helium "is more capable of moderating the inclination of the slope" than argon, "the film stress is easily controlled." This illustrates that the invention of Shinji is a technology completely different from the present invention.

More concretely, the invention according to the cited example of Shinji is to form a thin film on an extremely thin substrate (bare silicon substrate having a thickness of 480 μm). Therefore, the film stress must be substantially zero. The invention in the cited example is to provide the solution for this need. On the other hand, the thickness of the substrate according to the present invention (photomask blank) is usually about 2.3 mm for a substrate of 5 inch square and about 6.4 mm for 6 inch square, which means the substrate of the present invention is extraordinarily thick. Therefore, the acceptable limit of stress acting on the substrate is completely different from the invention of Shinji.

The object of the present invention is not to reduce the film stress to almost perfectly zero, but (1) to make the yield value of the photomask production within tolerance, and (2) to restrain the flatness degree within tolerance while preventing the occurrence of particles and pin holes. As a means to achieve the object, the present invention adopts the claimed requirements different from the invention in the cited example of Shinji.

Therefore, the present invention is a completely different technology in object (problem) and means to solve the problems from the cited example of Shinji, not identical to the invention described in the cited example of Shinji, and is not an invention derived easily from Shinji.

The teachings of Inoue are further removed from the present invention than the teachings of Shinji. Inoue thus does not remedy the deficiencies of Shinji and Yang.

More concretely, the invention described in the cited example of Inoue relates to a method of manufacturing a semiconductor device and sputtering equipment used for a

semiconductor manufacturing apparatus. A film material (sputter deposited) described in Inoue is metal silicide having a high melting point, and different from a chromium thin film in Shinji. Further, in Figures 20 and 21 in Inoue, sputtering power, a sputtering rate, a film yield (a conforming item rate) are described, and the cause of failure is different from that in the present invention. Further, Inoue appreciates larger sputtering power or faster sputtering rate, while the present invention finds it advantageous to conduct sputtering film formation with sputtering power which does not lower the production yield due to worsening of the film quality owing to particle occurrence from the target; in other words, to conduct sputter deposition under the condition of slow deposition rate (sputtering rate). Inoue and Shinji are different in the thin film materials for conducting sputter deposition from each other, and there is no motivation to combine both materials.

For at least the foregoing reasons, reconsideration and withdrawal of this rejection are respectfully requested.

B. Shinji with Yang, in View of Inoue and Further in View of Mitsui

Claims 34, 42 and 55-57 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over the teachings of Shinji and Yang, in view of the teachings of Inoue and further in view of the teachings of Mitsui (U.S. Patent No. 6,087,047). This rejection is respectfully traversed.

Mitsui was cited as allegedly suggesting the inclusion of oxygen and nitrogen into a thin film. However, even if one of ordinary skill in the art would have turned to the teachings of Mitsui in the manner alleged in the Office Action, such practitioner still would not have been led to the present invention. Specifically, nothing in Mitsui remedies any of the extensive deficiencies of Shinji, Yang and Inoue discussed above.

For at least this reason, reconsideration and withdrawal of this rejection are respectfully requested.

C. Mitsui

Claims 31, 33, 41, 48-50, 65 and 66 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over the teachings of Mitsui. This rejection is respectfully traversed.

Mitsui does not teach or suggest the photomask blank of claim 31 because Mitsui fails to teach or suggest a photomask blank having a flatness degree equal to -2 μm or less. Moreover, as Mitsui does not teach or suggest the deposition rate described in the present specification for achieving such a flatness degree, Mitsui cannot be found to inherently describe the recited flatness degree (contrary to the assertion in the Office Action).

Further, Mitsui does not teach or suggest the method of manufacturing a photomask blank according to present claim 50, Mitsui failing to teach or suggest that "the formation of said thin film is conducted at a thin film deposition rate in a manner that a particle occurrence frequency dependent on the thin film deposition rate is restrained so that the production yield rate dependent on the particle occurrence frequency is within tolerance."

For at least the foregoing reasons, Applicants respectfully submit that this rejection relying upon Mitsui is improper and must be withdrawn. Reconsideration and withdrawal of this rejection are respectfully requested.

V. Allowable Subject Matter

Applicants note with appreciation the indication in the Office Action that claims 35-40, 43-46, 58, 59, 61 and 62 contain allowable subject matter. New independent claim 68 should be allowable as including the allowable subject matter of claim 43.

VI. Conclusion

In view of the foregoing amendments and remarks, Applicants submit that claims 31-70 are in condition for allowance. Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner

is invited to contact Applicants' undersigned representative at the telephone number listed below.

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